Exhibit

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

SANDISK CORPORATION, a Delaware corporation,

Plaintiff,

vs. NO. C98-01115 CRB (PJH)

LEXAR MEDIA, INC., a California corporation,

Defendant./

DEPOSITION OF YUKUN HSIA, Ph.D.
VOLUME I

DATE: January 27, 2000

DAY: Thursday

TIME: 9:42 a.m.

PLACE: Wilson Sonsini Goodrich & Rosati
601 California Avenue
Palo Alto, CA 94304

PURSUANT TO: Notice

REPORTED BY: LINDA LAUBACH, RPR
CSR No. 11590

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REPORTER'S CERTIFICATE

I, LINDA LAUBACH, hereby certify that the witness in the foregoing deposition was by me duly sworn to tell the truth, the whole truth and nothing but the truth in the within-entitled cause;

That said deposition was taken down in shorthand by me, a Certified Shorthand Reporter, and a disinterested person, at the time and place therein stated, and that the testimony of the said witness was thereafter reduced to typewriting under my direction and supervision;

That the witness was given an opportunity to read and correct said deposition and to subscribe the same. Should the signature of the witness not be affixed to the deposition, the witness shall not have availed him/herself of the opportunity to sign or the signature has been waived;

I further certify that I am not of counsel or attorney for either/or any of the parties to the said deposition, nor in any way interested in the event of this cause, and that I am not related to any of the parties thereto.

Date: 2-3-00

Linda LauBach

LINDA LAUBACH
CSR No. 11590

Case Name: _____

Deponent: _____ Date: _____

Errata (Y/N): _____ Attached (Y/N): _____

Signature (Y/N): _____ Attached (Y/N): _____

Reporter initials/date: _____

Original sealed (Date): _____

16:32:45 MR. YOON: Okay. I have no further
16:32:46 questions, subject to my caveat about bringing
16:32:52 Dr. Hsia back.
16:32:53 THE VIDEOGRAPHER: This is the end of tape
16:32:54 No. 3 and concludes today's proceedings. We are now
16:32:58 off the record at 4:33.
(Whereupon, the deposition was concluded at 4:33 p.m.)

_____
YUKUN HSIA

Subscribed and sworn to before me
this _____ day of _____, 1998

_____
Notary Public in and for the State of
California, County of Santa Clara

15:48:07 1 We actually have stacks of wafers in the
15:48:14 2 cylindrical shape, okay; and it was in one of the
15:48:17 3 brochures that was sent out. So there are all kinds
15:48:19 4 of different systems studied, proposed, trying to get
15:48:23 5 funding on.
15:49:19 6 Q. Now, taking a look at paragraph 6, see that?
15:49:26 7 And I'm going to lines 25 and 26. Do you see that it
15:49:32 8 says, "rather than separate the wafer into individual
15:49:38 9 chips, mount each separate chip in a package and then
15:49:42 10 remount those packages and connect them on a circuit
15:49:45 11 board."
15:49:46 12 Do you see that? I'm sorry. I should have read
15:49:49 13 from line 24. Starting -- let me just read that into
15:49:52 14 the record; then I'll ask you the question.
15:49:54 15 "The idea behind WSI was to connect hundreds of
15:49:57 16 such separate chips on a single wafer, rather than
15:50:03 17 separate the wafer into individual chips, mount each
15:50:08 18 separate chip in a package and then remount those
15:50:12 19 packages and connect them on a circuit board."
15:50:14 20 Do you see that?
15:50:15 21 A. Yes, uh-huh.
15:50:16 22 Q. So is it correct to say that each MA within the
15:50:20 23 SSM was a separate chip?
15:50:22 24 A. Traditionally?
15:50:25 25 Q. Yes.
15:50:26 26 A. At that time, that would be considered a chip.

11:03:51 1 Q. Yes. Physically, 4K bits is equal to 512 bytes;
11:04:01 2 correct?
11:04:01 3 A. That's where I have some problem with that
11:04:04 4 because the memory is a sequential memory.
11:04:08 5 Q. Yes.
11:04:08 6 A. So the output is only 1 bit at a time.
11:04:12 7 Q. Yes.
11:04:12 8 A. So you don't count that as a byte in the sense
11:04:17 9 of the system.
11:04:18 10 Q. Uh-huh.
11:04:20 11 A. Okay?
11:04:21 12 Q. Okay.
11:04:23 13 A. Now, am I -- because I'm accessing -- when I try
11:04:28 14 to access this memory stack, I access 8 MAs at a time.
11:04:35 15 Q. Okay.
11:04:36 16 A. And a byte is -- 8 bit-byte is distributed into
11:04:45 17 1 bit per MA.
11:04:50 18 Q. I think I understand now.
11:04:51 19 A. Okay.
11:04:52 20 Q. With regards to the 8 MAs, which is -- basically
11:04:56 21 it would be 1 bit, each would go on to the bus, which
11:04:59 22 would be the byte of data.
11:05:01 23 A. That's right. Okay. That's why I was concerned
11:05:04 24 about it.
11:05:06 25 Q. Now I think we -- I understand.
11:05:08 26 A. Okay.

11:05:10 1 Q. So that for each of those in order to have a --
11:05:20 2 okay, so it makes sense. So that you have 8 MAs that
11:05:23 3 are accessed for a byte.
11:05:24 4 A. That's correct.
11:05:25 5 Q. And you serially are reading out 1 byte at a
11:05:30 6 time.
11:05:30 7 A. One bit at a time from each array so that you
11:05:34 8 compose 1 byte.
11:05:35 9 Q. Yes. So in each memory array, 1 bit is read out
11:05:40 10 at a time.
11:05:40 11 A. That's right.
11:05:41 12 Q. And 1 byte of information is provided in
11:05:45 13 parallel on the bus from the 1 bit from each memory
11:05:49 14 array; correct?
11:05:50 15 A. Well, it will come out; and then you will
11:05:53 16 constitute a 1-byte stream of 8 bits going out because
11:05:58 17 it's a serial memory.
11:06:01 18 Q. Okay. Why don't we take a look at figure 1 for
11:06:04 19 a second.
11:06:10 20 A. I think figure 1 on the Y, item 14, that's 8 --
11:06:16 21 it shows 8 arrays being -- that's a bus size of 8.
11:06:22 22 Q. Yes. And for those 8 being accessed, there was
11:06:28 23 1 bit from each of the MAs depicted in the figure
11:06:34 24 transmitted. So 8 bytes are sent to the interface
11:06:39 25 control unit.
11:06:40 26 A. That's correct.

11:06:41 1 Q. And this would be repeated 512 times to send to
11:06:47 2 the interface control unit 512 bytes of data. So,
11:06:53 3 serially, 512 bytes, 1 byte at a time, would be
11:06:58 4 transmitted over 14 to the interface control unit.
11:07:01 5 A. That's correct.
11:07:02 6 Q. Okay.
11:07:03 7 A. Now I think we're clear.
11:07:05 8 Q. Yes. Thank you. Now, with regards to the MA,
11:07:44 9 the memory array, which physically can store 4K to 16K
11:07:50 10 bits; correct?
11:07:53 11 A. See, that information -- that is a generic
11:07:58 12 statement.
11:07:58 13 Q. Yes.
11:07:59 14 A. The example we use assumes an 8K bit MA, if I
11:08:09 15 remember correctly.
11:08:09 16 Q. So this is an 8K bit MA, is the example.
11:08:13 17 A. Right.
11:08:15 18 Q. So that would be --
11:08:19 19 A. -- 4K. So when you access a set of 8 MAs, you
11:08:27 20 end up with 4K words.
11:08:29 21 Q. Okay. Now, it finally becomes clear to me.
11:08:34 22 Thank you, Dr. Hsia.
11:08:36 23 A. Okay.
11:08:37 24 Q. With regards to the 8 MAs -- which those 8 MAs
11:08:43 25 would constitute a block.
11:08:45 26 A. That's correct.

you already have erased previously, and then you can write -- there's a special command that was given in figure -- as item sector write -- some of instructions, depending on the instructions.

Q. Now, in a sector write command --

A. Uh-huh.

Q. -- one sector worth of data, would be written into the 8 MAs.

A. Yes. If you move everything into there, yes.

Q. Okay. So that when you read out that sector of data from the MAs, each MA would provide 1 bit, so that 1 byte at a time is read out.

A. That's correct.

Q. Okay. So that it could be a situation where 15/16ths of the available memory in a block is not utilized.

A. Yes, it is possible. If the computer program's written in such a way that they don't use the bounds of the unwritten space.

Q. Okay. Dr. Hsia, if you take a look at column 9 and 10 of the '248 patent, starting at line 67 and going to line 5 --

A. Of column 10?

Q. Yes.

A. Uh-huh.

Q. Why don't you read that to yourself for a

moment.

A. Yes.

Q. Is there any other discussion in the '248 patent regarding an EDAC or an EDAC unit, other than that discussed in column 9, line 66, to column 10, line 5?

MR. DeBRUINE: I'm going to object. The document speaks for itself.

THE WITNESS: I believe -- I believe that that one is put in there to point out the fact that indeed, okay, this is -- has been considered. But I do not recall it was detaily (sic) described elsewhere in -- within this particular patent description.

But it is obvious that it can be done because the way we do our organization is organized where you need this architecture. So it is always that it should be understood readily.

Q. (By Mr. Yoon) Okay. With regards to figure 5 --

A. Figure 5. Uh-huh.

Q. -- there is a dotted box that refers to the EDAC squared. Do you see that?

A. Yes, uh-huh.

Q. Is there any other figure in the '248 patent that you're aware of that discloses an EDAC unit?

A. Okay. In that case, it is not described in detail as for this particular example.

Q. Okay.

A. And let's see what I should say. It's just that it was -- at the time, the customer was not interested in that. We have other system built with that in.

Q. When you say "customer," who are you referring to?

A. This patent -- this particular example system was designed specifically -- or proposed specifically to a customer that are interested in that. We also -- at that time, that customer is a minor customer.

We have other customers who actually have designed the EDAC requirement into the memory systems, and just we happen to pull this example that is not including the EDAC.

Q. And what customers may have had an EDAC unit designed into an SSM?

A. There is a -- as it happens, it was a customer that is a classified customer, U.S. Government; and I believe that we had to report a design report. Was it in the --

MR. DeBRUINE: Jim, I believe what he's referring to were among the documents that we got you this morning.

Q. (By Mr. Yoon) But with regards to your declaration, that report was not attached.

A. In the declaration because I didn't -- yes, it

was not attached in the declaration because I didn't find it until -- in my archival storage in my garage. Didn't find until afterwards.

Q. Okay. Now, Dr. Hsia, the -- going back to column 9 and 10.

A. Yes.

Q. There's a statement there that says, "coupled with an error memory file." Do you see that? It's column 10, line 1 to 2.

A. Uh-huh.

Q. Was that error memory file a data file?

A. In the context of the memory stack, it would be a data file. It would be stored part and parcel in the memory stack.

Q. Okay. And I see here that the term "error memory file" is singular. Do you see that?

A. Yes.

Q. In the example shown in the '248 patent, was there a single error memory file?

MR. DeBRUINE: Objection. Document speaks for itself.

THE WITNESS: This one here identify a possible option. This relate -- this tie in the option.

Q. (By Mr. Yoon) Yes.

A. But in -- for example, in the design -- a

different design, for example, that file would be, of course, part and parcel of the file that is -- that is referred to earlier.

Because you need to have that integral with the reconfigurations set up in all that. So it should be tied in with the S -- with the RAM storage file referred to.

And additional also have to be clear too is that because we're bit organized -- so, for example -- just a very example is you want to add a parity bit, where often the disk memory have that -- that would be -- in that case now, for every byte, let's say, you add 1 bit.

So for one you might have 2 bits -- 2 parity bits and then in this case, now you're accessing the 8 arrays, you access 10 arrays.

Q. Okay. Now --

A. Just for clarity.

Q. Thank you, Dr. Hsia. With regards to the error memory file that's discussed in the '248 patent, is it your understanding that that file would be transferred to the RAM on the power-up of the system?

A. In the sense that they -- for example, in one design, we talking about single error detect and double error detect. So that information had to be stored in the file so that the system, later on, when

received from the host computer or would it be generated by the SSM?

A. In one design, it would be specifically generated by the memory controller. It would be invisible to the computer user because we would double check to make sure that the data integrity is there before we send out to the host computer.

Q. Uh-huh. Now, did you actually build a system with parity bits?

A. We design systems, but we actually did not build a system and market as such.

Q. Uh-huh. Now, you mentioned a system that -- I have to, during the lunch break, review the documents -- no, I appreciate that, Dr. Hsia. But you mentioned a system that was discussed in some report that used EDAC.

A. Yes, uh-huh.

Q. Now, in that system, was there an error memory file that was loaded up on power up into a RAM?

A. You know, I just -- in that particular, I haven't gone through in real detail because it was a major, major design effort there.

And I do know, though, the error code themselves are stored in the -- in connection with the data into the memory stack; and, additionally, knowing how the design has to be, the information generated by error

11:31:17 1 A. Yeah, wafers systems integration.
11:31:21 2 Q. Now, would that be the SSM that we've been
11:31:24 3 discussing or an example of an SSM?
11:31:27 4 A. Yes.
11:31:28 5 Q. Okay.
11:31:29 6 A. Or vice versa.
11:31:31 7 Q. With regards to an SSM or the implementation of
11:31:36 8 a solid-state memory that would emulate a disk
11:31:39 9 drive --
11:31:39 10 A. Yes.
11:31:40 11 Q. -- did you present any additional technical
11:31:42 12 information in China that is not disclosed in one of
11:31:46 13 the exhibits to your declaration?
11:31:47 14 A. No.
11:31:49 15 MR. DeBRUINE: Jim, can I just clarify
11:31:51 16 something for the record. In the lecture notes that
11:31:56 17 Dr. Hsia included in his declaration, there is
11:32:00 18 reference to and some figures incorporated from a 1979
11:32:05 19 paper. That paper is not part of his declaration. It
11:32:09 20 has been produced to you within the last couple weeks.
11:32:14 21 MR. YOON: Uh-huh.
11:32:15 22 MR. DeBRUINE: I'm just --
11:32:16 23 Q. (By Mr. Yoon) Just to make clear, we'll get to
11:32:19 24 your presentation materials.
11:32:21 25 A. Okay.
11:32:21 26 Q. Dr. Hsia, there are references or figures in the

11:42:45 Q. Okay. Let's say that there's an error found or
11:42:47 detected.
11:42:48 A. Okay.
11:42:48 Q. The device disclosed -- the SSM disclosed, would
11:42:53 dynamically change the physical address associated
11:42:56 with that magnetic disk sector address; correct?
11:43:00 A. If there's a command saying that, indeed, okay,
11:43:04 this error is unacceptable, we need to reconfigure
11:43:09 it -- this depends on the intelligence of the host
11:43:13 computer in the end -- then, yes, it would be -- then
11:43:17 the memory would be reconfigured in such a way that
11:43:20 the physical -- that address, the same address
11:43:24 physically, would address a different set low rate.
11:43:28 Q. And that's what you mean when you refer to
11:43:33 dynamic reconfiguration in paragraph 9 of your
11:43:37 declaration.
11:43:37 A. In a sense, yes.
11:43:39 Q. So dynamic configuration -- reconfiguration
11:43:42 refers to dynamically changing the physical address
11:43:46 associated with the magnetic disk sector address.
11:43:49 A. I guess the word dynamic may be a -- I guess --
11:43:56 I guess may be misleading or may be confusing. Let me
11:44:01 see how it's written again. Where's the line now
11:44:04 again?
11:44:05 Q. Line 2.
11:44:06 A. Okay, yeah. I think it just describes the

Q. Go to paragraph 10.
A. Uh-huh, okay.
Q. The first sentence there says, We also anticipated that at least error correction codes, open parentheses, ECC, referred to in the '248 patent as Error Detection and Corrections or "EDAC" would be stored in the memory blocks, along with the data from the host computer.
Do you see that?
A. Yes, uh-huh.
Q. What did you mean by the word "anticipated"?
A. Actually, I think that, in the sense that we actually have done that, maybe a better word would be -- we also have -- I guess anticipate mean we may not be -- let me think.
I should have said we also have designed in another system, okay. I shouldn't say anticipate because the word is not as good as I -- in terms of the meaning, now that you ask the question.
Q. Uh-huh. I understand. With regards to the '248 patent, there is no disclosure in that patent about the storage of ECC codes in the memory blocks; correct?
MR. DeBRUINE: I'll object that the document speaks for itself, mischaracterizes the document, and to the extent it's calling for a legal

conclusion.

THE WITNESS: I guess in the sense that in terms of the exact description of how the ECC codes are to be utilized and stored, it did not specifically -- it was not particularly articulated out in the patent.

But I -- at the time, actually, it seemed to be a very obvious thing in the sense that we actually had done another system that had the ECC codes. So it was not considered a major issue.

Because the way the memory stack is organized is a bit-organized structure. So ECC codes are very easily implemented by simple additions of another array in connection with the data that was being put together.

Q. (By Mr. Yoon) Okay. But, now, I'm not asking you with regards to -- obviously, you've mentioned the other system. But there is no express discussion of the storage of ECC in memory blocks in the '248 patent; correct?

MR. DeBRUINE: I'll object. Restate my past objections and that it's asked and answered.

THE WITNESS: I agree with him. I already answered that in the sense that we did not articulate how in what specific manners, but it is always from the organization of the memory stack since it's

bit-organized. And the ECC code is just an additional bit column to be used with the memory rates.

Q. (By Mr. Yoon) But, for example, in the block of the '248 patent --

A. Uh-huh.

Q. -- that we discussed earlier which stored 16 sectors' worth of data --

A. Uh-huh.

Q. -- in that block itself, as disclosed in the '248 patent, there is no room for ECC; correct?

MR. DeBRUINE: Objection. Asked and answered. The document speaks for itself.

THE WITNESS: Okay. The way this particular example is used to illustrate the concept, it did not -- since the example happened to be based on the system built for a particular system, and this is not something that asked for ECC codes.

So because of that, it did not incorporate -- in the example in the description, it did not incorporate the details of that.

Q. (By Mr. Yoon) Okay. Thank you. Now, we had discussed the -- or you had mentioned another system that may have had ECC code in it because of the bit organization. Do you recall that?

A. That's correct.

Q. That other system, was that -- was there

13:38:59 1 actually a working prototype of that system built?
13:39:02 2 A. There was a design also; however, the funding
13:39:06 3 did not forth come to support the design -- I mean the
13:39:11 4 construction of the prototype.
13:39:13 5 Q. So it was a design proposal that discussed using
13:39:17 6 ECC.
13:39:18 7 A. It was a design that was funded, but the
13:39:21 8 construction of the end system was not funded.
13:39:25 9 Q. Okay. Was that, the design of that system,
13:39:30 10 disclosed in any article that you published?
13:39:33 11 A. I think it was alluded to in an article which
13:39:40 12 probably was provided to you also in the articles
13:39:44 13 listed in my resume as one of my publications.
13:39:49 14 Q. Could you possibly point that out?
13:39:54 15 A. I'm not quite sure which particular one. We did
13:40:00 16 have a copy of that particular article.
13:40:04 17 Q. Was it --
13:40:04 18 A. Maybe John can help me to locate it.
13:40:07 19 Q. Well, John's not testifying but --
13:40:10 20 A. Well, I'm just wondering maybe if he can just
13:40:13 21 help me because it's in one of the -- maybe it's in
13:40:15 22 one of the papers that you have.
13:40:17 23 Q. Okay. Maybe, and I'll try to get the materials
13:40:20 24 out.
13:40:20 25 A. It shows a long system that have 72 bits per
13:40:25 26 word --

14:05:22 1 customer community. If nothing else, just to market
14:05:25 2 the project.
14:05:26 3 Q. And you don't know whether or not such customers
14:05:28 4 were required to sign an NDA before they received a
14:05:32 5 copy of the document.
14:05:32 6 A. Normally, they don't request that. McDonnell
14:05:37 7 Douglas deal with customers who usually don't want to
14:05:42 8 sign that.
14:05:43 9 Q. But you don't know one way or the other. And
14:05:49 10 you, yourself, were not involved in the distribution
14:05:52 11 of this document.
14:05:52 12 A. No.
14:06:00 13 Q. Now, did McDonnell Douglas ever build a system
14:06:08 14 according to this design?
14:06:09 15 A. Not to my knowledge, in terms of building it.
14:06:18 16 Q. Now, with regards to the system that's discussed
14:06:22 17 in this document, Exhibit 145, could the ECC
14:06:33 18 information that's stored in the memory already be
14:06:36 19 erased separate from the data it's associated with?
14:06:40 20 A. Okay. The way ECC work is that it is for each
14:06:48 21 word -- let's say that in this case, you know, 64-bit
14:06:54 22 long, there will be an 8-bit ECC code --
14:06:58 23 Q. Yes.
14:06:58 24 A. -- that is attached to the word. And in the
14:07:03 25 normal operation, when you want to erase the data
14:07:10 26 associated -- that particular data, then you

automatically erase all of the ECC code; otherwise, the ECC code have no meaning anyway. So you erase together in conjunction with that.

Q. Could you erase the ECC code separately from data?

A. Technically, you could. I mean if you give it some special instructions, you probably could; but actually, there's no real reason for doing a separate erase of the ECC code, as far as I can tell.

Q. So if I understand it correctly, your testimony is that you're not aware of any logical reason why you would erase the ECC separate from the data.

A. The ECC code associated with the word; that's correct.

Q. But you don't know whether or not -- was it -- putting aside whether or not it was reasonable to do it, it is correct to say that you could erase the ECC code separate from the data.

A. If the customer specifically request me to do that, I'll do it for them. Okay. Technically, it's doable. I know exactly how to do it in a sense.

Q. So the system had the flexibility to erase the data separate from the ECC and the ECC separate from the data.

MR. DeBRUINE: Objection. Vague and ambiguous as to "system." Mischaracterizes the